

## DECLARATION

Applicant: Atsushi FUKUI et al.

Application No.: 10/815,976

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Title: Dye-Sensitized Solar Cell and Manufacturing Method Thereof

### DECLARATION PURSUANT TO 37 C.F.R. 1.132

1. I, Atsushi FUKUI, hereby declare that:

I am one of inventors of the above-identified U.S. application;

I graduated in 2001 from Doctor of Philosophy in Engineering, Department of Applied Physics, Graduate School of Engineering, Osaka University in Japan;

I have been employed by SHARP KABUSHIKI KAISHA since 2001, where I am involved in a research work of Dye-Sensitized Solar Cell; and

I am aware that the above-identified U.S. application has been rejected over US 2002/0040728 (hereinafter referred to as "Yoshikawa").

2. A dye-sensitized solar cell was manufactured as follows, and experimental tests were carried out in order to evaluate properties of the dye-sensitized solar cell and to verify that a dye-sensitized solar cell of the present invention applied to a chemical treatment with use of an acetonitrile solution of dimethylpropylimidazolium iodide (DMPII) has improved photoelectric conversion efficiency compared with a dye-sensitized solar cell of Yoshikawa applied to a chemical treatment (described as an "aftertreatment" in Yoshikawa) with use of an acetonitrile solution of t-butyl pyridine (TBP).

The dye-sensitized solar cell of the present invention was manufactured in accordance with Examples 1 and 3 (see page 18, line 10 to page 20, line 23; and page 22, line 19 to page 23, line 11 of the present specification) except that cis-bis(isothiocyanato)-bis-(2,2'-bipyridyl-4,4'-dicarboxylato) ruthenium(II) (trade name: Ruthenium 535 manufactured by Solaronix Co. in Switzerland) as a dye sensitizer was adsorbed on a porous semiconductor layer (TiO<sub>2</sub>); a dye sensitizer-adsorbed porous semiconductor layer was immersed in an organic molecule solution to be described below (i.e., the chemical treatment); and then an organic molecule solution-immersed porous semiconductor layer was injected with an electrolytic solution to be described below. The dye-sensitized solar cell thereby manufactured was then evaluated for its characteristics.

(Organic Molecule Solution)

Acetonitrile (manufactured by Kishida Chemical Co., Ltd. in Japan) solution of 0.2 M dimethylpropylimidazolium iodide (manufactured by Shikoku Corp. in Japan)

(Electrolytic Solution)

Acetonitrile (manufactured by Kishida Chemical Co., Ltd. in Japan) solution of 0.8 M dimethylpropylimidazolium iodide (manufactured by Shikoku Corp. in Japan), 0.1M lithium iodide (manufactured by Aldrich, Inc.) and 0.1 M iodine (manufactured by Aldrich, Inc.)

In the meanwhile, the dye-sensitized solar cell of Yoshikawa was manufactured as described above except that the above-mentioned dye sensitizer-adsorbed porous semiconductor layer was infiltrated with the above-mentioned electrolytic solution by a capillary phenomenon (i.e., the "aftertreatment") (see claims 7, 8 and 11 of Yoshikawa). The dye-sensitized solar cell thereby manufactured was then evaluated for its characteristics.

Results thereby obtained are shown in Table A below.

Table A

	Jsc (mA/cm <sup>2</sup> )	Voc (V)	FF	Effi (%)
Experiment corresponding to the present invention (Example 3)	15.1	0.74	0.70	7.82
Comparative Experiment corresponding to Yoshikawa	15.3	0.66	0.67	6.77

### 3. Conclusion

According to the results shown in Table A, it is obvious that the dye-sensitized solar cell of the present invention, in which the dye sensitizer-adsorbed porous semiconductor layer was subjected to the chemical treatment using the organic molecule solution only comprising the alkylated imidazole salts as a solute, is clearly superior in open-circuit voltage and cell characteristics to the dye-sensitized solar cell of Yoshikawa, in which the dye sensitizer-adsorbed porous semiconductor layer was infiltrated with the electrolytic solution comprising the alkylated imidazole salts and other types of electrolytic compositions.

In the dye-sensitized solar cell of Yoshikawa, iodine and the like, which are ingredients of the electrolytic solution besides the alkylated imidazole salts, are deemed to react with the dye sensitizer adsorbed on the

dye sensitizer-adsorbed porous semiconductor layer in advance of the alkylated imidazole salts. Therefore, the alkylated imidazole salts and the dye sensitizer of Yoshikawa did not interact with one another and did not achieve the effects that the present invention did.

Consequently, the present invention such that the dye sensitizer-adsorbed porous semiconductor layer is immersed in the solution only comprising the alkylated imidazole salts is different from the invention of Yoshikawa such that the photoelectrode (i.e., the dye sensitizer-adsorbed porous semiconductor layer) is treated with the acetonitrile solution as the electrolytic solution comprising methylpropylimidazole salts and the other types of the electrolytic compositions. Therefore, the effects achieved by the present invention are different from those of Yoshikawa.

4. It is declared by the undersigned that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed on June 8, 2010

Atsushi FUKUI

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